



THERMOGRAPHY FACILITY

Purpose:

To detect defects beneath insulation, paint, and laminated composites.

The space flight industry is rapidly changing and introducing stronger, stiffer, and lighter composites into vehicle designs. As a result, MSFC's inspection teams needed a more flexible and portable system for detecting defects beneath insulation, paint, and laminated composites. Thermography is a nondestructive inspection technique that uses an infrared (IR) camera to measure temperature variations and hence identify voids, foreign inclusions, wrinkled plies, separated unbonds, and low resin content in composites. In using this technique a material is thermally excited by a high-energy source (e.g., quartz lamp, or high intensity flash). As the material cools, the emitted infrared radiation can be analyzed with a thermal-imaging camera measuring the surface temperature. Different materials absorb and release energy at different rates as heat propagates through, thereby creating a thermal image related to the material quality in deeper layers of the material.

Thermography is particularly useful for examining composite materials because many are nearly invisible to x-rays. Delamination (or voids) inside the composite will create air-filled pockets that act as insulators. The area inside and around this insulated area will cool at a different rate than the remainder of the material, thus creating a slightly altered thermal image.

This facility has IR cameras capable of resolving temperature differences down to 0.025 degrees C and collecting images in a digital video format; automating and synchronizing a predictable heating source with data acquisition; and easily storing and enhancing the resulting images. The system can also quantify the size and severity of delamination. With this process, MSFC can analyze composite materials for potential delamination problems and quantify delamination/porosity within composite material. Current projects using this technique include the ET Composite Nose Cone and the composite fuel and oxidizer tank development.



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